REMARKS

Claims 68-70, 72, 78-93 are pending in the present application. In the Office Action dated June 18, 2003, the Examiner rejected claims 68-70, 72, 78-93 under 35 U.S.C. § 103(a) as being unpatentable over the references as applied in paragraph 16 of the previous Office Action, specifically, either Japanese Patent No. 08-064,561 to Naoki ("Naoki") or U.S. Patent No. 5,439,551 to Meikle *et al.* ("Meikle"). The Examiner further takes Official Notice that it would have been obvious to one skilled in the art to supplement the disclosures of either Naoki or Meikle with an automatic control means. The Examiner has further rejected claims 68-70, 72, 78-93 under 35 U.S.C. § 103(a) as unpatentable over the Naoki and Meikle references, and further in view of either U.S. Patent No. 5,868,896 to Robinson, *et al.* ("Robinson") or U.S. Patent No. 5,700,180 to Sandhu, *et al.* ("Sandhu"). In view of the following amendments and remarks, reconsideration of the present application is respectfully requested.

The disclosed embodiments of the invention will now be discussed in comparison to the prior art. Of course, the discussion of the disclosed embodiments, and the discussion of the differences between the disclosed embodiments and the prior art subject matter, do not define the scope or interpretation of any of the claims. Instead, such discussed differences merely help the Examiner appreciate important claim distinctions discussed thereafter.

Applicant discloses a microelectronic substrate with implanted materials that allows accurate detection of an endpoint of chemical mechanical planarization of such substrates, particularly those having complex topographies (*i.e.*, as a plurality of recesses and raised surfaces) that must be polished to form a uniform blanket surface. In the disclosed embodiments, a relatively small amount of the endpoint detection material is implanted beneath the surface of the microelectronic substrate at a depth "d" which, when reached by the planarizing process, is indicative of having achieved a blanket surface for the microelectronic substrate. In addition, the endpointing material is implanted in a specified thickness "t" at the selected depth d below the surface of the microelectronic substrate. The implanted substance is implanted at a concentration that does not affect the electrical properties of the microelectronic substrate, for example at about 0.0001% to about 0.1%. Typically, the distance d is about 200 A and the thickness t is about 100 to 500 A, so that the endpointing material is detected across substrates having complex surface topologies. During the planarization of the microelectronic

substrate, the materials released into the slurry are monitored by vaporization of a sample of the slurry using *mass spectroscopy, emission spectrometry or similar species analyzers*. The first detection of the endpointing material at the first depth d indicates that planarization has gone at least to the predetermined depth. The last detection of the endpointing material indicates that planarization has continued at least to a depth equal to the thickness t of the endpointing material beneath the surface, indicating that planarization has formed a blanket surface and is therefore complete.

When the endpointing material is detected by the mass spectrometer, emission spectrometer or similar species analyzers, a control system coupled to the foregoing devices and to the planarization machine receives a control signal from the device, and halts the planarization of the substrate by stopping relative motion between the carrier assembly and the platen. The species analyzer and the control system may be cooperatively configured to stop the planarization process shortly after the detection of the endpointing material. Alternatively, the control system and the species analyzer may be configured to allow planarization to proceed for a predetermined period of time following the detection of the endpointing material.

The Naoki reference discloses a planarization apparatus configured with a mass spectrometer for detecting the endpoint of the planarization process. However, the Naoki reference fails to disclose such an apparatus configured with a control system that is coupled to a mass spectrometer that may be used to interrupt the planarization process when the endpoint material is detected. Moreover, the Naoki reference fails to disclose or fairly suggest that the control system may be configured to interrupt the planarization process at a predetermined time interval following the exposure of the endpointing material.

The Meikle reference also discloses a planarization process that permits the determination of a polishing endpoint. In particular, Meikle discloses various means for determining the endpoint, including the detection of an audio signal from the substrate, or determining a change in an audio signal as the endpoint is reached. Meikle also discloses chemical and optical methods for determination of the endpoint. In particular, a system for monitoring a pH level in a slurry material is disclosed that monitors the pH of the slurry as the endpointing material is exposed and distributed into the slurry (col. 5, lines 30-40). No control is disclosed that is coupled to a mass spectrometer that interrupts the operation of the planarization machine upon the determination of a change in the pH concentration of the slurry. Although

Meikle discloses that a mass spectrometer may be used to detect the exposure of an endpoint material in the substrate (col. 6, lines 1-11), Meikle fails to disclose a control system coupled to the mass spectrometer. If the undersigned has missed a relevant teaching in the foregoing references, the Examiner is respectfully requested to point out where the relevant teachings may be found.

The Examiner readily admits that the applied art fails to teach a control system that is coupled to a mass spectrometer, and take Official Notice that a control system is well known. However, applicant respectfully submits that the Examiner's use of Official Notice in the present situation is improper. As set forth in the MPEP, section 2144.03, the Examiner may take Official Notice of facts outside of the record which are capable of instant and unquestionable demonstration as being "well known" in the art. In the present case, the apparatus, which includes a controller operating in combination with a mass spectrometer and a planarization device are not capable of instant and unquestionable demonstration as being well known in the art, precisely because the particular combination of elements is the inventive contribution of the Applicant. The MPEP also states that no documentary proof for Official Notice is needed in cases where such knowledge is of "notorious character." There is no such notorious character regarding the combination of elements disclosed in the present method.

The foregoing section of the MPEP further requires that assertions of technical facts in areas of esoteric technology must always be supported by citation of some reference. If the Examiner believes the technical field of this application is not esoteric, then in the absence of citing technical references, 37 C.F.R. 1.104(d)(2) provides that Applicant is entitled to obtain an affidavit from the Examiner providing data that is "as specific as possible" in support of a reference made (here, the reference is "Official Notice"). The rule further provides that Applicant is entitled to contradict such an affidavit or provide further explanation in response thereto.

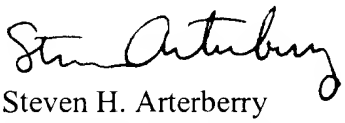
If the Examiner intends to rely upon the Sandhu reference, applicant respectfully submits that the reference fails to disclose a control system coupled to a mass spectrometer. Instead, Sandhu discloses a control system that interacts with various devices to assess the thickness of a film on a substrate, including a laser interferometer (col. 7, lines 35-40), a device to measure a capacitance change (col. 7, lines 50-52), and an acoustic device for measuring wave propagation in the thin film (col. 7, lines 53-54). Sandhu does not disclose or even fairly suggest

that the control system may be coupled to a mass spectrometer. Further, if the Examiner intends to rely on the Robinson reference, applicant notes that Robinson teaches a control system coupled to a plurality of piezoelectric sensors, including pressure and/or shear stress sensors positioned behind a substrate. Robinson does not disclose or fairly suggest that the control system may be coupled to a mass spectrometer.

Turning now to the claims, patentable differences between the claim language and the applied art will be specifically pointed out. Claim 68 recite in pertinent part, "An apparatus for detecting the endpoint of a planarizing process comprising... a planarizing device having a first portion and a second portion movable relative to the first portion to remove material from the microelectronic substrate positioned therebetween, the material including atoms of the first and second substances...*transport means to move the material from the planarizing device...a mass spectrometer coupled to the transport means to receive the material and detect the atomic mass of the second substance...and...a controller operatively coupled to the planarizing device and the mass spectrometer to control motion of the planarizing device upon receiving a control signal from the mass spectrometer.*" (Emphasis added). As described in detail above, the asserted combination does not teach or fairly suggest this. Claim 68 is therefore allowable. Claims depending from claim 68 are also allowable based upon the allowability of the base claim and further in view of the additional limitations in the dependent claims.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,
DORSEY & WHITNEY LLP



Steven H. Arterberry
Registration No. 46,314

Enclosures:
Postcard
Fee Transmittal Sheet

DORSEY & WHITNEY LLP
1420 Fifth Avenue, Suite 3400
Seattle, Washington 98101-4010
(206) 903-8800 (telephone)
(206) 903-8820 (fax)

h:\ip\documents\clients\micron technology\400\500431.04\500431.04 final oa 061803 response.doc
4825-8745-3952\1 8/15/2003